ERAGROSTIS ANCASHENSIS (POACEAE: CHLORIDOIDEAE), A NEW SPECIES FROM ANCASH, PERU

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ABSTRACT

Eragrostis ancashensis P.M. Peterson, Refulio & Tovar, sp. nov., is described and illustrated. The new species occurs on steep rocky slopes in three distinct locations in Departamento Ancash: near the southern end of the Cordillera Blanca, approximately 20 km E of Raquia, near Huaylas, and near Bambas, just north of the Cordillera. The new species seems most closely allied with *Eragrostis magna* Hitchc. but differs by its shorter culms (26–84 cm long); shorter and narrower leaf blades [(6–)10–22(–26) cm long × 1–2.5(–3.0) mm wide]; shorter panicles [10–20(–38) cm long]; shorter branches (1.5–11 cm long) that are widely spreading; ovate spikelets (3–6.1 mm long × 2–4.5 mm wide) with a long ciliate (the hairs up to 1.5 mm long) and flattened rachilla; veins of the glumes, lemmas, and paleas usually with minute, whitish, raised glands; broadly ovate lemmas 2–3.2 mm long; and anthers 1.2–2.0 mm long.

RESUMEN

Eragrostis ancashensis P.M. Peterson, Refulio & Tovar, sp. nov., es descrita e ilustrada. Esta nueva especie habita en pendientes de suelos rocosos, en tres localidades distintas del departamento de Ancash: cerca del extremo sur de Cordillera Blanca, aproximadamente a 20 km E de Raquia; cerca a Huaylas y cerca a Bambas, al norte de la Cordillera Blanca. Esta nueva especie está fuertemente relacionada con *Eragrostis magna* Hitchc., pero difiere de ella por sus culmos más cortos (26–84 cm de largo); sus láminas foliares más cortas y menos anchas [(6–)10–22(–26) cm de largo 3 1–2.5(–3.0) mm de ancho]; panículas más cortas [10–20(–38) cm de largo]; ramas de la panícula más cortas (1.5–11 cm de largo) y extendidas; espiguillas ovadas (3–6.1 mm de largo 3 2–4.5 mm de ancho), raquila aplanada y ciliada (pelos hasta 1.5 mm de largo); nervios del las glumas, lemas y páleas usualamente con glandulas diminutas y blanquecinas; lemas anchamente ovadas 2–3.2 mm de largo; y anteras 1.2–2.0 mm de largo.

While making determinations of Peruvian material using the treatments of Tovar (1993), Renvoize (1998), and Laegaard and Peterson (2000), the first and second authors recognized the unique features of three grass collections. These specimens were distinguished by their dark green and plumbeous-spotted spikelets with a ciliate, flattened rachilla. The new species is clearly a member of subfamily Chloridoideae, tribe Eragrostideae,

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subtribe Eragrostidinae (Peterson et al. 1995, 1997). We describe these specimens as a new species of *Eragrostis*, and ascribe the specific epithet to the Departamento Ancash.

Eragrostis ancashensis P.M. Peterson, Refulio & Tovar, sp. nov. (**Fig. 1**). TYPE: PERÚ. DEPARTAMENTO ANCASH. Provincia Recuay: Cordillera Blanca, approximately 20 km E of Raquia on Route 02-014 on road towards Huaraz (10° 8' 55.8" S–77° 19' 48.8" W), 3000 m, 20 Mar 1997, *P.M. Peterson & N. Refulio Rodriguez 13793* (HOLOTYPE: USM!; ISOTYPE: K! MO! NY! RSA! TAES! UC! US! WIS!).

Ab *Eragrostis magna* Hitchc. rhizomatibus nullis, culmis 26–84 cm altis, laminis (6–)10–22(–26) cm longis 1–2.5(–3.0) mm latis, paniculis 10–20(–38) cm longis ramis 1.5–11 cm longis effusis, spiculis 3–6.1 mm longis 2–4.5 mm latis ovatis, rhachilla complanata ciliata trichomatibus usque ad 1.5 mm longis, venis glumarum lemmatum palearum plerumque glandulis albidis elevatis, antheris 1.2–2.0 mm longis recedit.

Caespitose perennials. Culms 26–84 cm tall, erect, terete near base, glabrous below the nodes; nodes mostly basal or 1 rarely 2 above; internodes glabrous. Sheaths 6–16 cm long, longer that the lower internode if present, mostly glabrous or with scattered hairs near the summit, the hairs up to 1.3 mm long; margins mostly smooth usually with a large tuft of hairs near the summit, these hairs up to 3 mm long; collar visible, yellowish. Ligules 0.4–0.7 mm long, a line of hairs, sometimes these hairs extending up to 2.5 mm long, these breaking off at maturity. Blades (6–)10–22(–26) cm long, 1–2.5(–3.0) mm wide, flat above the ligule to tightly involute above, apically acuminate, usually densely pilose-villous near base above and below to sparsely pilose-villous near base and glabrous above, the hairs up to 2.5 mm long. Panicles 10–20(–38) cm long, 5–15 cm wide, open, the loosely flowered branches spreading 20–80 o from the culm axis; inflorescence branches mostly 1.5–11 cm long, naked near base, with spreading secondary branches, one to three per node; pulvini in the axils of primary and secondary branches villous, the hairs up to 5 mm long; pedicels 1.2–6 mm long, delicately spreading, sinuous to flexuous, scaberulous. Spikelets 3–6.1 mm long, 2–4.5 mm wide, florets 3–8, ovate, compressed, dark green with small plumbeous spots; rachilla flattened, usually densely ciliate along the margins, the hairs up to 1.5 mm long; disarticulation with the glumes first then the lemmas falling individually leaving the paleas on the rachilla. Glumes 2–2.8 mm long, lanceolate to ovate, membranous, shorter than the lower lemma, about equal in length, 1-veined, keeled, scaberulous along the keel and usually with minute, whitish, raised glands; apex acute to acuminate, often mucronate, the mucro up to 0.5 mm long. Lemmas 2–3.2 mm long, broadly ovate, membranous, 3-veined, lateral veins somewhat obscure, keeled, scaberulous along the keel and near the apex, the veins usually with minute, whitish, raised glands; apex acute, often darker than below. Paleas 1.8–3.1 mm long, elliptic, bowed-out, membranous, the keels usually with minute, whitish, raised glands; apex truncate to obtuse, sometimes minutely erose. Lodicules 2, 0.2–0.3 mm long, cuneate, fleshy, non-vascularized. Stamens 3, anthers 1.2-2.0 mm long, yellow to purplish at maturity. Ovaries 0.3–0.5 mm long; styles 2, separate, glabrous, stigmas 2, feathery, white to purplish. Caryopses 0.7–0.9 mm long, rectangular-prismatic, deeply grooved on the adaxial (ventral) surface, striate, dark reddish brown.

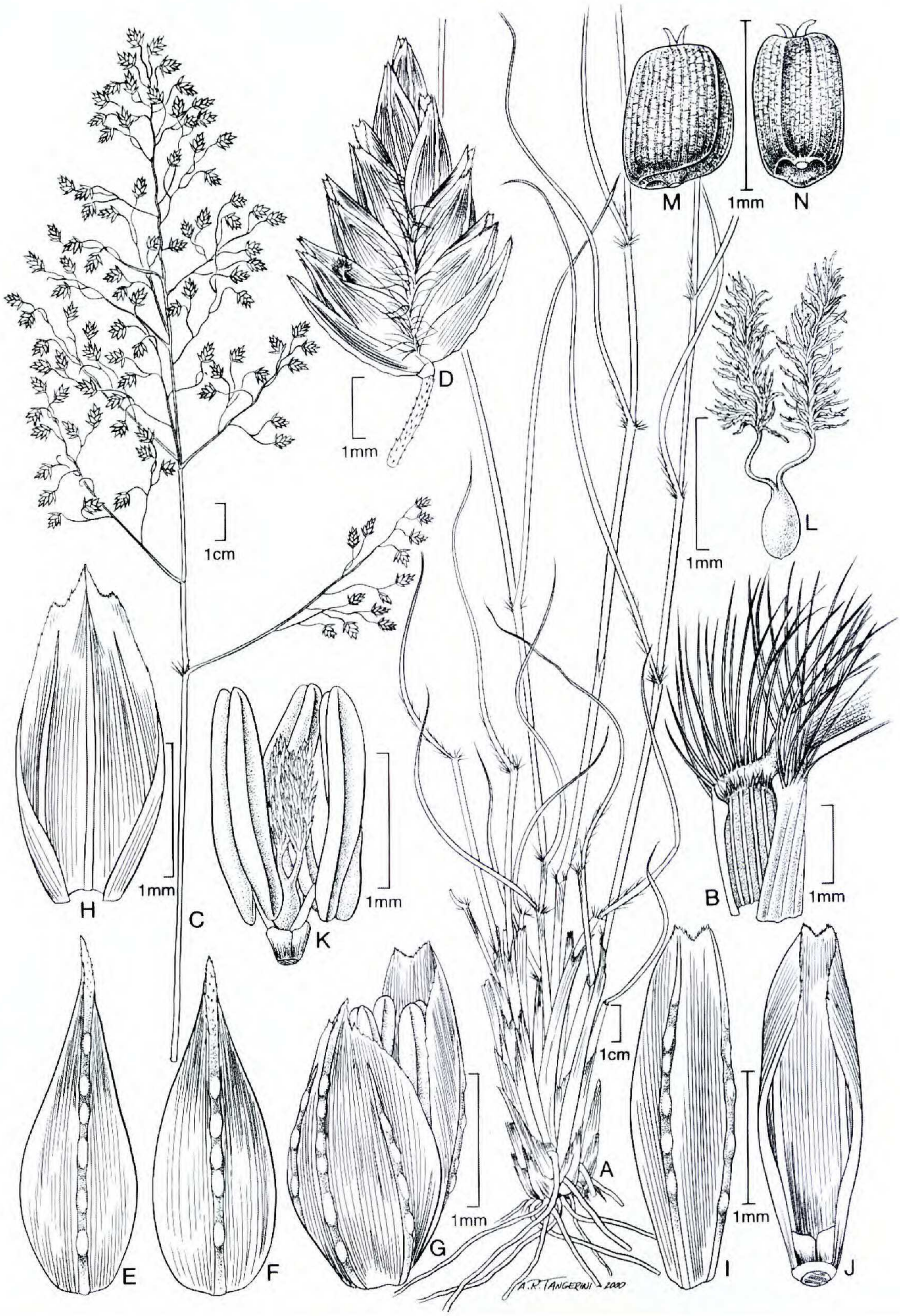

FIG. 1. *Eragrostis ancashensis* (*Peterson & Refulio Rodriguez 13793*). A. Habit. B. Sheath and ligule. C. Inflorescence. D. Spikelet. E. Lower glume, dorsal view. F. Upper glume, dorsal view. G. Floret, as viewed from the dorsal side of lemma. H. Lemma, ventral view. I. Palea dorsal view. J. Palea, ventral view. K. Stamens, pistil, and lodicules. L. Gynoecium, mature. M. Caryopsis, lateral view. N. Caryopsis, ventral view.

Phenology.—Flowering in mid to late March through May, with caryopses in June (*R. Ferreyra 14577*).

Distribution.—*Eragrostis ancashensis* is known only from Departamento Ancash in three distinct locations: near the southern end of the Cordillera Blanca (type locality in Provincia Recuay), near Huaylas (Provincia Huaylas), and near Bambas (Provincia Corongo), just north of the Cordillera. Individuals of *E. ancashensis* can be found growing on steep rocky slopes at mid elevations (2200–3220 m) associated with xerophytic plants such as: *Agave, Commelina, Lupinus, Puya, Vicia, Viguiera,* and other shrubby Asteraceae.

Additional specimens examined: **PERU. Departamento Ancash:** Provincia Corongo, 7 km NW of Yupan on road towards Bambas, 3220 m, 26 Mar 1997, *Peterson & Refulio Rodriguez 13915* (US, USM); 7 km NW of Bambas, 2710 m, 26 Mar 1997, *Peterson & Refulio Rodriguez 13919* (US, USM); Provincia Huaylas, between Caráz and Huallanca, 2200-2300 m, 2 Jun 1962, *R. Ferreyra 14577* (USM); between Huaylas and el Callejón, 2400-2500 m, 3 Jun 1962, *R. Ferreyra 14594* (USM).

LEAF ANATOMY

Cross-sectional leaf blade anatomy was determined from hand sections of dry material (*Peterson & Refulio Rodriguez 13915*) on temporary slides. Therefore, an illustration is not presented, since the chlorenchyma tissue and parenchyma bundle sheath cells were mostly collapsed.

The blades are typically kranz-C4, PCK-like [phosphoenolpyruvate carboxykinase or classical PCK type, defined as centrifugal/evenly distributed photosynthetic carbon reduction (PCR) cell chloroplasts (with grana), XyMS+ (presence of cells between the metaxylem vessel elements and laterally adjacent chlorenchymatous tissue, see also Hattersley and Watson 1976), and presence of PCR cell wall suberized lamella, in Hattersley and Watson's (1992) sense] since the chlorenchyma appears loosely arranged and quite regularly is contiguous (not interrupted by a column of colorless cells) between adjacent vascular bundles. The lamina are involute with primary, secondary, and tertiary vascular bundles decreasing in size. The primary vascular bundles are well differentiated into xylem with metaxylem, phloem, and a double bundle sheath (mestome and parenchyma bundle sheath). However, the parenchyma bundle sheath of the primary vascular bundles is interrupted on the abaxial and sometimes the adaxial surface by a girder of fibers. In secondary vascular bundles only the abaxial parenchyma bundle sheath is interrupted by a girder of fibers whereas in tertiary bundles the parenchyma bundle sheath is contiguous. The ribs are flattened with angled sides (rectangular) and the furrows are 1/5 to 1/2 as deep as the thickness of the blade adaxially and usually less than 1/5 as deep abaxially. The medium vascular bundle structure consists of a simple keel with only a single primary vascular bundle. Per blade there are 9–13 primary vascular bundles and 20–28 secondary and tertiary vascular bundles. There are two or three secondary or tertiary vascular bundles placed between each primary vascular bundle. The xylem of the primary vascular bundles contains two wide metaxylem vessels that are about the same size as the parenchyma bundle sheath cells. The mestome, or inner sheath, is always

TABLE 1. Salient features comparing *Eragrostis ancashensis* with *E. magna*.

Characters	*E. ancashensis*	*E. magna*
Rhizomes	absent	present
Culm heights	26–84 cm	to 150 cm
Blades, lengths	(6–)10–22(–26) cm	40–60 cm
Blades, widths	1–2.5(–3.0) mm	3–7 mm
Inflorescence lengths	10–20(–38) cm	30–50 cm
Inflorescence branch lengths	1.5–11 cm, spreading	12–20 cm, ascending
Pedicels aspect	sinuous to flexuous, reflexed	flexuous, ascending
Spikelet shape	ovate	linear-lanceolate
Spikelet lengths	3–6.1 mm	7–10 mm
Spikelet widths	2–4.5 mm	2–2.3 mm
Rachilla vestiture	ciliate, hairs up to 1.5 mm along entire length	ciliate, hairs less than 0.2 mm only at base of lemma
Rachilla shape	strongly flattened	mostly terete
Veins of the glumes, lemmas, and paleas with minute, whitish, raised glands	usually present	absent
Lemma lengths	2–3.2 mm	2–2.5 mm
Lemma shape	broadly ovate	elliptic
Anther lengths	1.2–2.0 mm	1.2–1.5 mm

present in the vascular bundles surrounding the xylem and phloem. Chlorenchyma cells radiate just outside the parenchyma bundle sheath cells and are often contiguous between adjacent bundles forming a loosely radiate arrangement (PCK-like). One to four rows of sclerenchyma fibers form the abaxial and adaxial girders which are wide near the epidermis and narrow toward the vascular bundle. Sclerenchyma fibers form a narrow and very pointed projection along the margin of blade.

DISCUSSION

The new species seems allied to species of *Eragrostis* subgenus *Caesiae* Van den Borre since the majority of these species are PCK-like and perennial (Van den Borre & Watson 1994). We suspect that the closest sister to the new species is *E. magna* (Hitchcock 1927) since it shares many features, e.g., dark green and plumbeous-spotted spikelets with a ciliate rachilla (reduced to a tuft of hairs below each floret in *E. magna*), very few culm nodes (one or two), and rectangular-prismatic caryopses. *Eragrostis ancashensis* differs from *E. magna* by 15 characteristics (see Table 1), most notably: shorter culms (26–84 cm tall); shorter and narrower leaf blades [(6–)10–22(–26) cm long x 1–2.5(–3.0) mm wide]; shorter panicles [10–20(–38) cm long]; shorter branches (1.5–11 cm long) that are widely spreading; ovate spikelets (3–6.1 mm long x 2–4.5 mm wide) with a long ciliate (the hairs

up to 1.5 mm long), flattened rachilla; veins of the glumes, lemmas, and paleas usually with minute, whitish, raised glands; broadly ovate lemmas 2–3.2 mm long; and anthers 1.2–2.0 mm long.

Another possible sister to the new species might be *E. macrothyrsa* Hack., mentioned by Hitchcock (1927) as having the same aspect. However, *E. macrothyrsa* differs from *E. ancashensis* by having taller culms (1–1.6 m tall), larger blades (20–45 cm long x 4–15 mm wide), longer panicles (40–60 cm long), shorter glumes (1.2–2 mm long), shorter lemmas (1.5–2 mm long), and shorter anthers (0.6–1 mm long). The distribution of *E. macrothyrsa* is also more southern, occurring in Paraguay (type), Brazil, and Bolivia.

There exists considerable variation among the accessions of *E. ancashensis* that may warrant taxonomic consideration in the future when more collections are available. The specimens from 7 km NW of Bambas *(Peterson & Refulio Rodriguez 13919)* and between Caráz and Huallanca *(Ferreya 14577)* are taller, more robust individuals with less pubescence (hairs shorter and less dense on the blades, sheath and inflorescence pulvini), slightly smaller florets, and shorter hairs present on the rachilla. Both of the collections from Provincia Huaylas *(Ferreya 14577 & 14594)* have less hairs that are shorter on the spikelets.

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REFERENCES

Hattersley, P.W. and L. Watson. 1976. C4 grasses: an anatomical criterion for distinguishing between NADP-malic enzyme species and PCK or NAD-malic enzyme species. Australian J. Bot. 24:297–308.

_____ and _____ . 1992. Diversification of photosynthesis. Pp. 38–116 in Grass evolution and domestication, ed. C. P. Chapman. Cambridge University Press: Cambridge.

Hitchcock, A.S. 1927. The grasses of Ecuador, Peru, and Bolivia. Contr. U.S. Natl. Herb. 24 (8):291–556.

Laegaard, S. and P.M. Peterson. 2000. 214 (2). Gramineae (Part 2-Chloridoideae) in G. Harling & L. Andersson (eds.), Fl. Ecuador # (in press).

Peterson, P.M., R.W. Webster, and J. Valdés-Reyna. 1995. Subtribal classification of the New World Eragrostideae (Poaceae: Chloridoideae). Sida 16:529–544.

_____, _____, _____ . 1997. Genera of New World Eragrostideae (Poaceae: Chloridoideae). Smithsonian Contr. Bot. 87:1–50.

Renvoize, S.A. 1998. Gramineas de Bolivia. Royal Botanic Gardens, Kew.

Tovar, O. 1993. Las Gramínees (Poaceae) del Perú. Ruizia 13:1–480.

Van den Borre, A. and L. Watson. 1994. The infrageneric classification of *Eragrostis* (Poaceae). Taxon 43:383–422.